CLAIMS

I claim:

1. A process for the conversion of biomass material into charcoal or carbonized charcoal, comprising the steps of:

(a) sealing said material in an enclosed container having a proximal end and a distal end whereby the non-inert contents of said container consist of said material and air;

(b) pressurizing said container with air;

(c) heating said material to cause it to ignite and burn;

(d) controlling the pressure within said container at value P_1, so that it does not exceed a limit pressure value P_{limit}, by releasing gas from said container;

(e) optionally delivering additional air into said container to attain a temperature of above about 400 °C throughout said material while controlling said pressure at P_1;

(f) and releasing gas from said container to lower said pressure to pressure value P_2.

2. A process according to claim 1 wherein said steps (b) and (c) are performed in reverse order.

3. A process according to claim 1 wherein in step (e) said air is delivered to the proximal end of said container, and said pressure is controlled at pressure P_1 below P_{limit} by releasing said gas from the distal end of said container.

4. A process according to claim 1 wherein in said step (c) said material is heated from said distal end.

5. A process according to claim 3 wherein subsequent to step (f) additional air continues to be delivered to the proximal end of said container at said pressure P_2 to sustain combustion for a period of time.

6. A process according to claim 1 wherein a decrease in pressure by the controlled release of said gas to a lower pressure level in step (f) is repeated two or more times to successively lower pressures to completely carbonize the biomass material.

7. A process according to claim 6 wherein said gas is released from the distal end of said container.

8. A process according to claim 1 wherein tinder is sealed within said container to facilitate ignition of said biomass material.

9. A process according to claim 1 wherein in step (c) heating is ceased after said biomass material ignites.

10. A process according to claim 1 wherein said gas released from said container is externally recovered and burned in an external combustor.

11. A process according to claim 1 wherein said gas released from said container is delivered at elevated temperature and pressure to a catalytic afterburner.

12. A process according to claim 1 wherein said gas released from said container is delivered at elevated temperature and pressure to a steam or gas turbine or gas engine to generate power.

13. A process according to any of claims 1 through 11 further comprising the steps of (g) reducing said pressure to atmospheric pressure by the release of gas from said container, and (h) removing the hot charcoal or carbonized charcoal without its exposure to sufficient air or oxygen to cause combustion thereof.

14. A process according to claim 1 wherein said biomass material is moist.

15. A process according to claim 1 wherein said biomass material is dry.

16. A process according to claim 1 wherein P_{limit} is about 400 psig.

17. A process according to claim 1 wherein the amount of additional air delivered into the container is less than about 2 kg per kg of dry biomass feed loaded.

18. A process according to claim 1 wherein the pressure is controlled below P_{limit} by sequentially releasing gas from the proximal end of said container, and then releasing gas from the distal end of said container.

19. A process according to claim 1 wherein said container is vertically positioned so that said proximal end is at the top and said distal end is at the bottom.

20. A reactor for pyrolytic conversion of biomass material into charcoal and gas comprising,
a housing having a proximal end, a distal end and a sealable opening for receiving a removable canister containing said material;
a heater;
a first valved gas exit orifice at the proximal end of said housing; a second valved gas exit orifice at the distal end of said housing;
a valved air entry orifice for introducing air to the proximal end of said canister;
insulation surrounding at least a portion of the sides of said canister;
said canister being receivable in said housing such that there is minimal exposure of the contents of said canister to the atmosphere when said sealable opening is open.

21. A reactor according to claim 20 wherein said heater comprises a resistance heater located to heat the biomass material in the distal end of said canister.

22. A reactor according to claim 20 further comprising an exterior burner communicating with said second valved gas exit.

23. A reactor according to claim 20 wherein said valved entry orifice comprises a tube passing through the distal end of said housing and having an open end at the proximal end of said canister.

24. A reactor according to claim 20 wherein said housing is vertically positioned so that said proximal end is at the top and said distal end is at the bottom.